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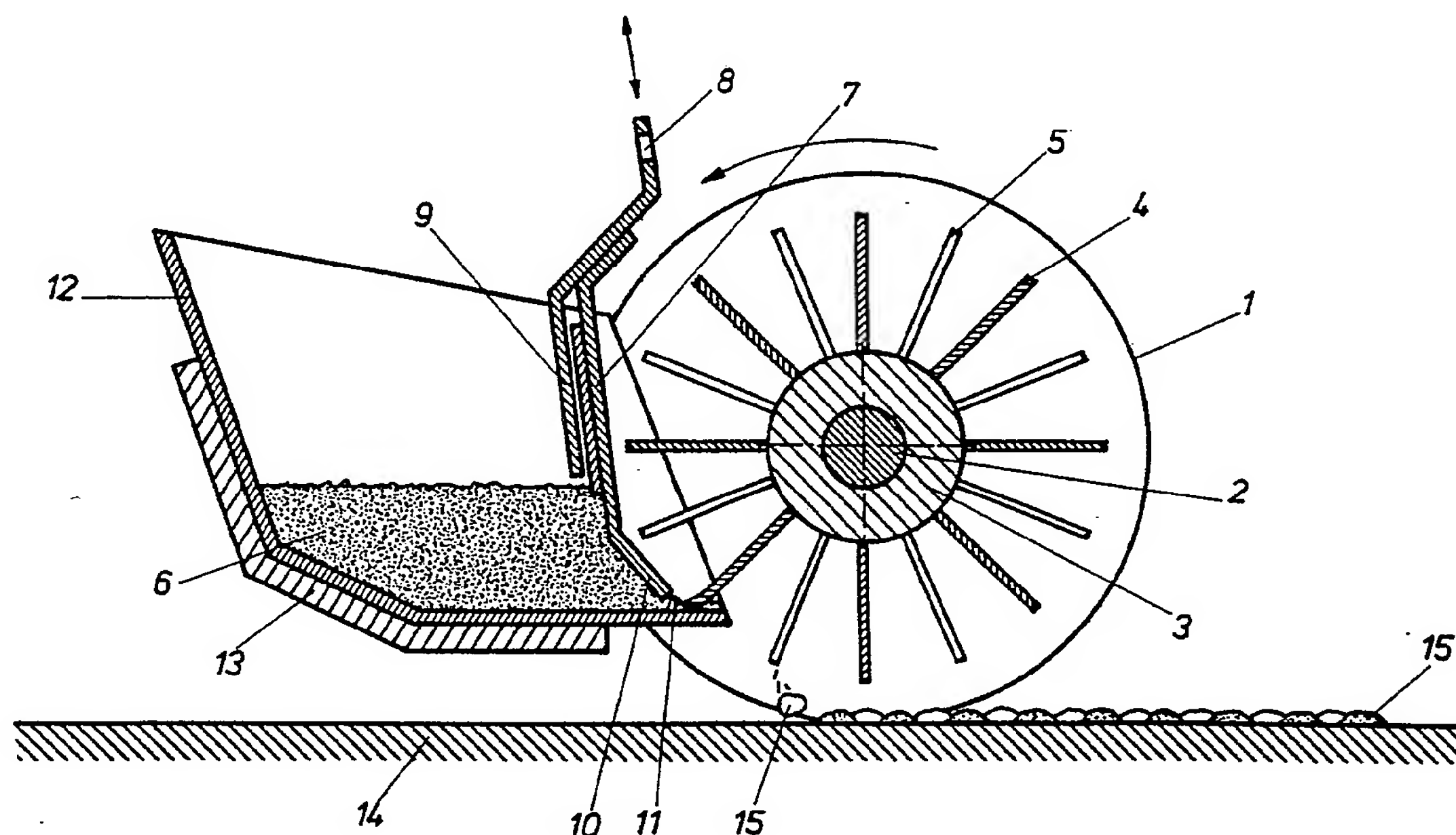
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(54) Title: METHOD AND APPARATUS FOR THE LAYING OUT OF A STRIPE ON A ROAD SURFACE



(57) Abstract

In order to lay-out a stripe on a road surface (14) in an economic and practical manner, the stripe can consist of individual blobs (15) of stripe material. By supplying the material (6) via a slot to a position through which slats (4, 5, 18) on a rotating brush pass during the turning of the brush, each slat carries with it a blob of the material which it throws down on the road surface. Both flexible as well as stiff slats can be used in accordance with requirements. By providing the slats (18) with a U-shaped section, one can throw out larger blobs at a relatively high speed of rotation, and thus blobs can be laid-out at speeds right up to around 50 km per hour. In order to render the laying-out independent of the rate of advance of the apparatus, one can couple a motor (19) which can turn the axle, and thereby the brush, independently of the normal driving via a driving wheel (1, 16).

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METHOD AND APPARATUS FOR THE LAYING OUT OF A STRIPE
ON A ROAD SURFACE.

The invention relates to a method for the successive
5 application of a stripe on an under layer, such as a
road surface, by the laying-out of a material which
is fluid at the moment of application, and a laying
-out apparatus for the execution of the method.

10 In the laying-out of stripes, particularly on road
surfaces, in practise there are used two different
methods, depending on the kind of stripe.

For continuous lines, the apparatus generally used
15 has a slot from which is pressed out a band of ther-
moplastic material which slides down on to the road
surface, and to which it adheres. By suitable regu-
lation of the slot breadth and height and the speed
of laying-out, the dimension of the stripe can be
20 determined and synchronized with the feed rate of
the apparatus.

This method demands a complicated apparatus which
can only lay out coherent stripes. This means that
25 a considerable consumption of material is demanded,
which results in a high laying-out cost. Moreover,
the speed of laying-out is relatively low, usually
around 5 km per hour, because the stripe cannot be
pressed out more quickly without losing its uni-
30 formity.

Another method of striping is executed by means of
an apparatus having a series of nozzles directed to-
wards the under layer, from which nozzles a number

of blobs are discharged in the desired stripe width. Thus during the feeding forward of the apparatus, a stripe will be formed consisting of a pattern of individual blobs.

5

By a suitable choice of speed, discharge frequency and feed rate for the apparatus, a stripe with the desired structure can be produced. This apparatus is likewise very complicated and, because of the large
10 number of nozzles, is particularly difficult to operate and maintain. Moreover, the rate of advance of the apparatus is relatively low.

By another method, the stripe material is thrown on
15 to the road surface by means of a rotating brush, which is fed via a liquid receptacle comprising rotating brushes or rollers. This method has limited application possibilities, the reason being partly that it requires a relatively thin-flowing material,
20 and partly because it is limited to a relatively low rate of advance.

Finally, it is known for the stripe material to be sprayed out under pressure through one or more noz-
25 zles. The method is used both in the small, hand-operated trolleys mounted with one or more spray cans, and in large self-propelled units. With spray cans, only a quite thin and not particularly hard-wearing layer can be applied, and the large self-propelled
30 units use a very complicated technique. None of these methods can be used to effect patterned stripes.

It is the object of the invention to remedy the men-

tioned disadvantages of the known methods, and this is achieved by a method whereby the material is supplied from a position raised above the underlayer, from which position a number of slats, by a movement
5 from above the material to down through the material, convey said material and deposit it on the underlayer.

First and foremost, the possibility is thus achieved
10 of effecting patterned striping at high rates of advance without the stripe material having to be supplied under pressure. Furthermore, an adjustment can be carried out of the distance between the laid-out blobs, since this will depend on the speed of the
15 slats, the closeness of the slats and the rate of advance over the underlayer. One can hereby produce stripes consisting of single blobs with any desired blob distance. This means that one is able to select precisely that pattern which provides the most ex-
20 pedient stripe with regard to traffic and safety aspects. Moreover, the laying-out can be effected with the lowest possible consumption of material, and thus at the lowest possible price.

25 By letting the slats be mounted on a rotating axle, as presented in claims 2 and 6, the throwing-out can easily be controlled by a suitable choice of rotational speed of the brush.

30 By letting the direction of rotation of the slats be such that the slats fling the blobs backwards during the laying-out, as presented in claim 3, blobs of material can be laid out on the underlayer even at relatively high rates of advance, and this

without the blobs being too low for reasons of smearing out.

By letting the slats rotate raised above the under-
5 layer, as presented in claim 4, a stripe pattern can be formed which consists solely of blobs which are not smoothed out by the brush.

By laying-out a thin layer of stripe material on top
10 of and between the blobs, as presented in claim 5, a more hard-wearing stripe is achieved, even though the blobs are worn severely down, and also the re-striping is made easier since new blobs can be deposited at random in the stripe track.

15 By using an apparatus which is driven by a wheel running on the underlayer, as presented in claim 7, the driving and the synchronization of the throwing-out can be ensured.

20 By providing the brush axle with a motor which is independent of the drive wheel, as presented in claim 8, one can use the apparatus at very low rates of advance, and with any desired blob distance completely
25 pletely independently of the rate of advance.

By staggering the slats on the axle, as presented in claim 9, one can produce stripes in which the blobs on the underlayer are staggered in rows in relation
30 to one another. This provides a very uniform pattern.

By using flexible slats, as presented in claim 10, one can produce a stripe consisting of small blobs

which, in many cases, is expedient, particularly with narrow stripes.

By letting the slats be stiff, as presented in claim 5 11, a considerable blob speed can be achieved, and therewith a high rate of advance, even with very viscous stripe materials.

Finally, as presented in claim 12, it is expedient 10 to let the slats have a U-shaped profile, in that one can hereby lay out blobs of a relatively large volume, and thus produce a stripe consisting of larger blobs.

15 The invention will now be described in closer detail with reference to the drawing, where

fig. 1 shows a cross-section through a laying-out apparatus with flexible slats,

20

fig. 2 shows a second laying-out apparatus seen from the rear and with stiff slats,

25 fig. 3 shows a cross-section through this apparatus,

fig. 4 shows a section through a slat seen in the direction IV-IV in fig. 3, and

30

fig. 5 shows the rearmost of the apparatus seen from above.

In fig. 1 is shown a preferred embodiment of a lay-

ing-out apparatus with flexible slats 4, 5, which are staggered.

The apparatus comprises a material delivery part and
5 a throwing-down part.

The material delivery part comprises a container 12, which is supplied with the material which is to be laid. Preferably, this will be a hard-wearing stripe
10 paint to which reflecting glass beads or coarse material for non-skid security is added. The apparatus can also be mounted with a heating element 13 for striping with thermoplastic masses. By a suitable regulation of the temperature, the viscosity of the
15 material can be adjusted to suit the conditions.

The delivery from the container is effected through a slot, this being formed between the bottom of the container 12 and a vertically movable gate 10. This
20 gate is structured to comprise a guide 7, 9, which extends in a sliding manner around a part of the container. By sliding the gate 10 in the vertical direction by means of a wheel 8, the height of the slot - and thereby the material thickness 11 - can
25 be adjusted.

The material 11 flows out or is pressed out on to a shelf which is positioned a suitable distance above the roadway 14.

30

The throwing-down part comprises an axle 2 with a hub 3 to which a number of flexible slats 4, 5 are secured to form a rotating brush.

During rotation in the direction of the arrow, the slats will pass through the supplied material 11, whereby a blob 15 is loosened from the shelf, carried down by the slat and thrown down onto the roadway to form a stripe 15.

Since it is the slats 4, 5 which form the stripe, by a suitable choice of slat number, slat width and their positioning, one can obtain any desired structure. The slats can thus be mounted in a staggered manner in a longitudinal direction on the axle, whereby a pattern as shown in fig. 5 can be formed. The stripe produced in this way, when seen at an angle from above, will appear as a coherent stripe.

15

This gives a considerable saving in material, and also provides good draining possibilities, which means that it is not so easy for a dangerous covering of water to arise on the stripe. Moreover, a stripe of this kind will more easily keep itself clean, because the polluted water will drain between the blobs.

The brush is driven by a friction wheel 1, which runs on the roadway 14 during the advance of the apparatus. This advance can be effected by manual movement with smaller units, or by the mounting on self-propelling devices of any suitable kind.

30 A second embodiment is shown in figs. 2-5. This apparatus also comprises a material delivery part and a throwing-down part.

In fig. 3, the delivery part is shown in section. It

comprises a container 21 for the material 6. The material is introduced via a channel system or the like. Also this container can be provided with heating elements for the heating of the material 6.

5

A gate 22 can be moved up and down to determine the height of the slot, and thereby the thickness of the material 11 which is delivered through the slot.

- 10 The apparatus is mounted with a frame 20, see fig. 2, whereby it can be secured to a tractor or similar self-propelled unit.

Also here the throwing-down part comprises a rotating axle 17 which is provided with slats 18.

The slats are shown mounted in a staggered manner on the axle 17, see fig. 2. Each slat, as shown in section in fig. 4, is made of a U-profile of metal. The profile is mounted on the axle in such a way that the open side of each slat faces forwards in the direction of rotation, as will appear from the arrow in fig. 3.

- 20 Each slat, when it passes down through the pressed-out material 11, will thus carry with it a blob 15 which can be of a relatively large volume.

By a suitable choice of slat width, material thickness and length, the blob 15 can attain the desired dimension.

On this embodiment, there is also mounted a motor 19, which will normally be an electromotor. This

motor can be coupled to the axle 17, and thus independently of the rate of advance over the roadway, one can give the axle 17 and thereby the slats 18 the desired speed of rotation, and hereby achieve
5 the desired stripe pattern.

In figs. 3 and 4, the slats 18 are shown mounted on the axle 17 in a staggered manner in relation to the centre of the axle. The slats should form an angle
10 of less than 90° to the material 11, so that this is thrown off against the roadway 14 in an unfailing manner.

As will appear from the drawing, the slats 4, 5, 18
15 will pass through and convey stripe material 6 in the lowest foremost part of the slats' rotational movement, which is the same as the apparatus' wheel 1, whereby the blobs will be thrown backwards during the laying-out. Even at relatively high rates of advance right up to around 50 km per hour, this provides a relatively low laying-out speed for the blobs
20 when they hit the roadway, which ensures that the blobs can attain sufficient height and not spread out on the roadway.

25 In practice, the electromotor will be allowed to drive the axle 17 at low rates of advance, which in practice will be lower than 15 km per hour. At higher speeds, the motor 19 can be decoupled and the
30 turning taken over by a drive wheel 16 which is then coupled to the axle 17.

This laying-out apparatus provides the possibility of optional stripe patterns at all rates of advance.

In fig. 5 is shown an example of a laid-out pattern which comprises a confluence of blobs for the formation of a coherent stripe 23, forward to a stripe with distance between the individual blobs.

5

Finally, the laying-out apparatus can be provided with equipment (not shown) for a subsequent laying down of a thin, coherent layer of stripe material on top of and between the blobs, so that the stripe appears as a uniform stripe with the blobs as elevations in the stripe. In principle, this equipment corresponds to that shown in fig. 1, but where the stripe material 6, however, is more free-flowing, and where the slats 4, 5 can be more flexible and
10 mounted closer together, almost as a brush.
15

Such a stripe is safer for traffic, in that even when it has worn down, it remains white, and it will be relatively easier to renew, since new blobs can
20 be laid down on the stripe in an arbitrary manner.

25

30

C L A I M S

1. Method for the successive application of a stripe on an underlayer, such as a road surface, by the laying-out of a material which is fluid at the moment of application, characterized in that the material (6) is supplied (11) to a position which is raised above the underlayer (14), from which position a number of slats (4,5,18), by a movement from above the material (11) to down through the material (11), convey said material and deposit it (15) on the underlayer (14).
2. Method according to claim 1, characterized in that the slats (4,5,18) describe a rotating movement and pass through the material (11) on their way downwards towards their lowermost point.
3. Method according to claim 2, characterized in that movement of the slats (4,5,18) towards their lowermost point is in a rearward direction in relation to the material (15) which is deposited on the underlayer (14).
4. Method according to claims 1-3, characterized in that the slats (4,5,18) rotate without touching the underlayer (14).
5. Method according to claims 1-4, characterized in that a thin layer of material is applied on top of and in between the material (15) deposited on the underlayer (14).
6. Laying-out apparatus for use in the exercising

of the method according to claims 1-5, c h a r a c -
t e r i z e d in that the slats (4,5,18) are mount-
ed on a rotating axle (2, 17).

- 5 7. Laying-out apparatus according to claim 6,
c h a r a c t e r i z e d in that the axle (2,17)
is driven by a wheel (1,16) running on the under-
layer (14).
- 10 8. Laying-out apparatus according to claims 6 and
7, c h a r a c t e r i z e d in that the axle (17)
can also be coupled to a motor (19) for driving.
9. Laying-out apparatus according to claims 6-8,
15 c h a r a c t e r i z e d in that the slats (4,5,
18) are staggered in relation to each other on the
axle (2,17).
10. Laying-out apparatus according to claims 6-9,
20 c h a r a c t e r i z e d in that the slats (4,5,
18) are flexible.
11. Laying-out apparatus according to claims 6-9,
c h a r a c t e r i z e d in that the slats (4,5,
25 18) are stiff.
12. Laying-out apparatus according to claims 10 and
11, c h a r a c t e r i z e d in that the slats
(18) have a U-shaped profile and are mounted on the
30 axle (17) in such a manner that the open side of the
profile faces towards the material (11) during the
movement through said material towards the lowest
point of the slats (18).

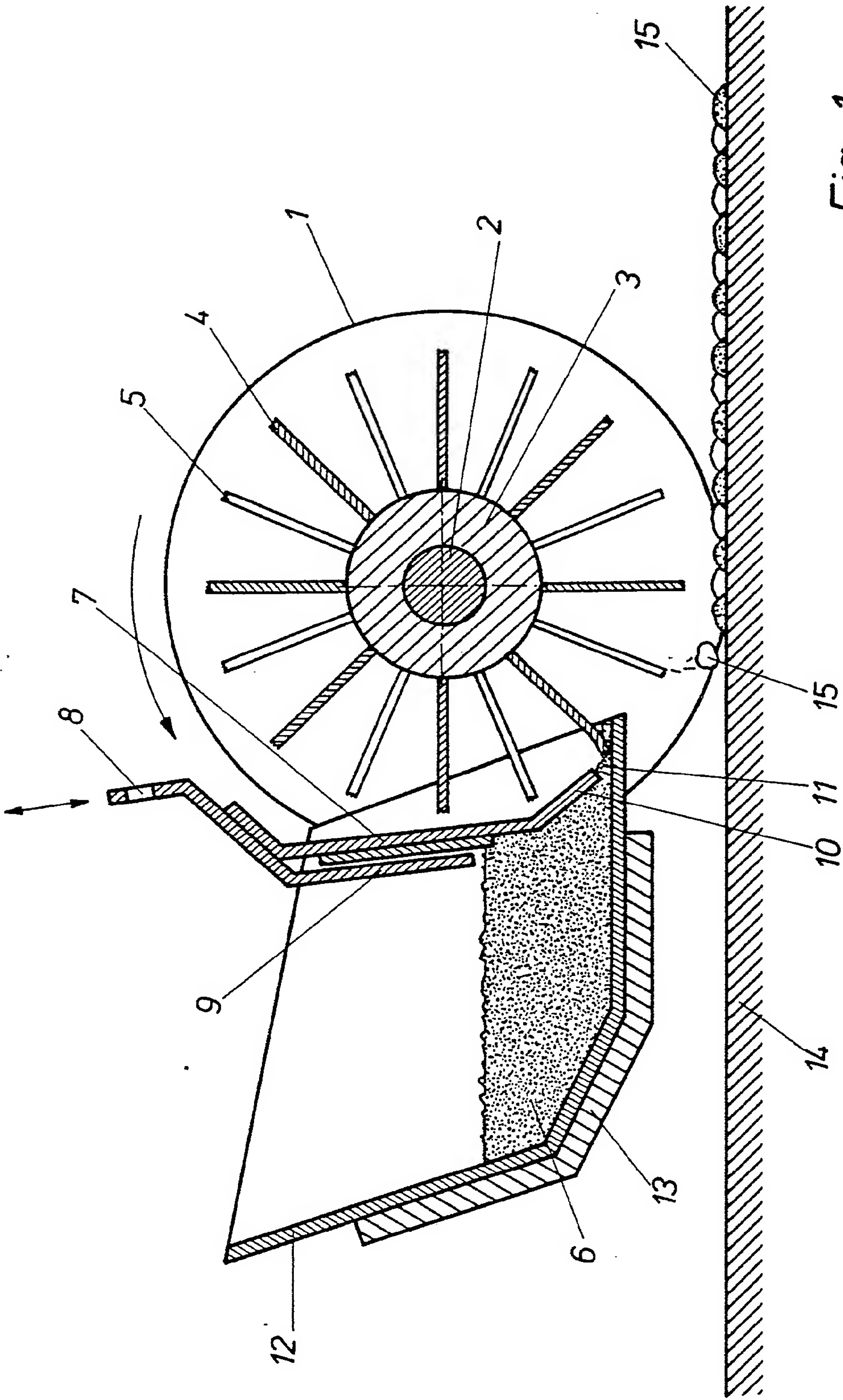


Fig. 1

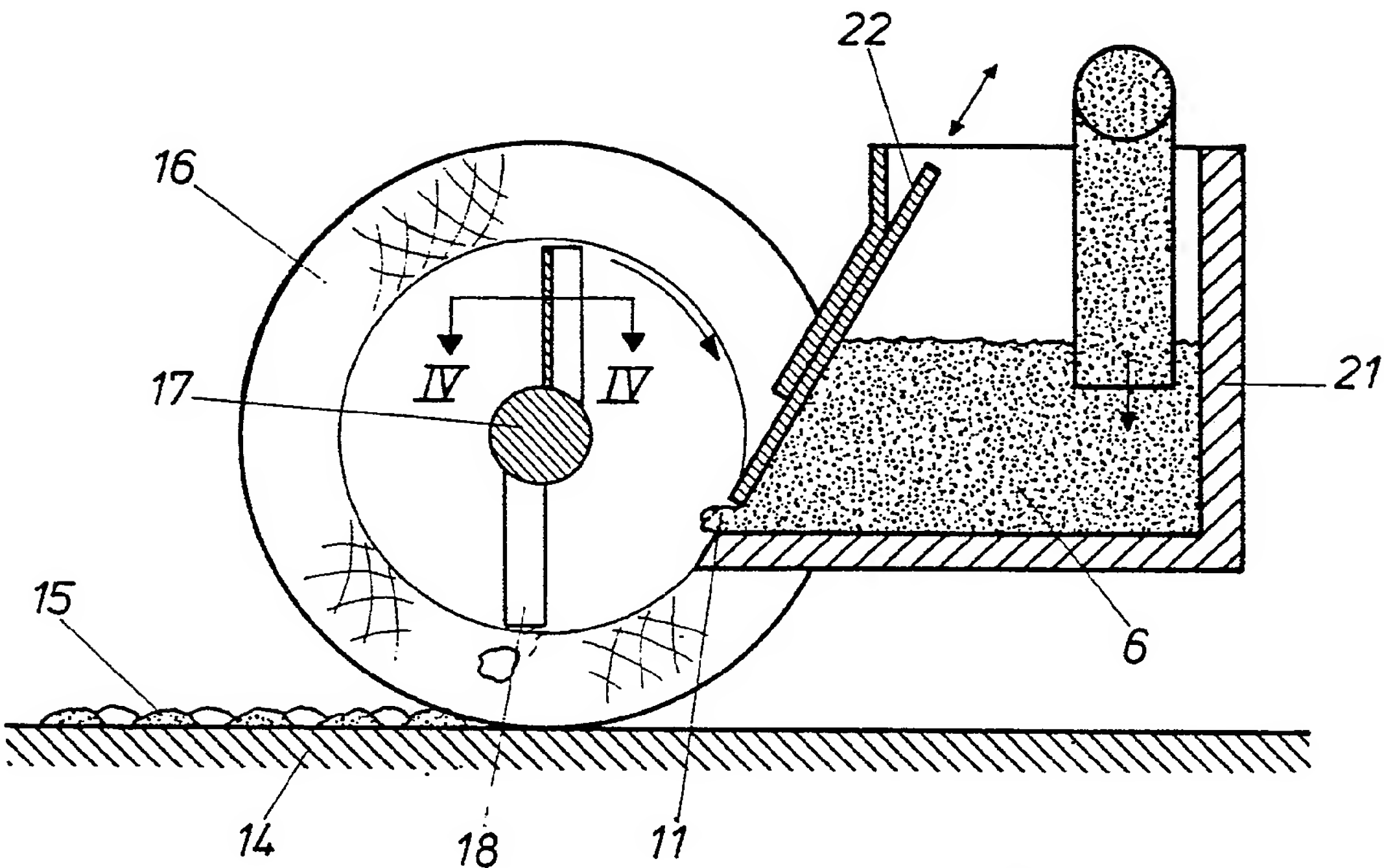


Fig. 3

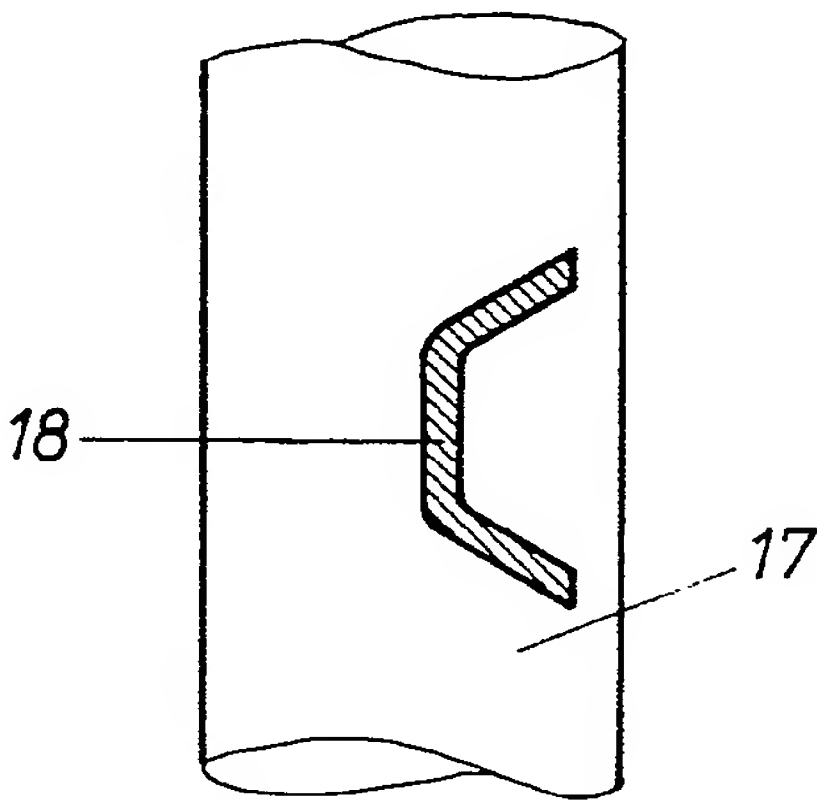


Fig. 4

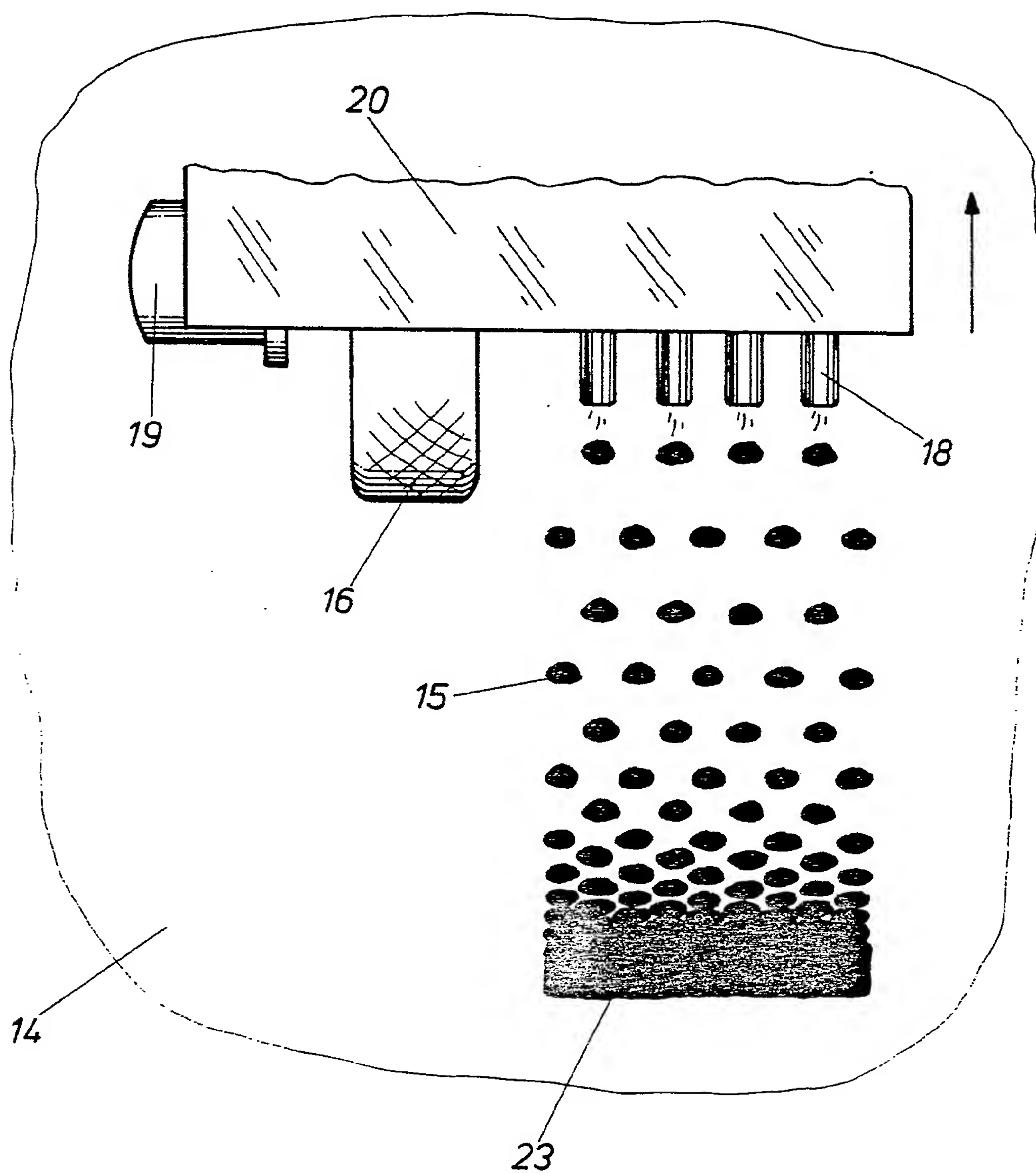


Fig. 5

INTERNATIONAL SEARCH REPORT

International Application No

PCT/DK85/00087

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ⁶ According to International Patent Classification (IPC) or to both National Classification and IPC <div style="text-align: center; padding: 5px;">B 05 C 5/00, E 01 C 23/16</div>																													
II. FIELDS SEARCHED <div style="text-align: center; padding: 5px;">Minimum Documentation Searched ⁷</div> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 25%; padding: 5px;">Classification System</th> <th style="padding: 5px;">Classification Symbols</th> </tr> <tr> <td style="padding: 5px;">IPC 4</td> <td style="padding: 5px;">B 05 C 5/00, /02, 9/00, /02, 17/00, /10, /12; E 01 C 23/16</td> </tr> <tr> <td style="padding: 5px;">Nat Cl</td> <td style="padding: 5px;">75c:22/03 .../...</td> </tr> </table> <div style="text-align: center; padding: 5px;">Documentation Searched other than Minimum Documentation to the extent that such Documents are Included in the Fields Searched ⁸</div> <div style="text-align: center; padding: 10px;">SE, NO, DK, FI classes as above</div>			Classification System	Classification Symbols	IPC 4	B 05 C 5/00, /02, 9/00, /02, 17/00, /10, /12; E 01 C 23/16	Nat Cl	75c:22/03 .../...																					
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III. DOCUMENTS CONSIDERED TO BE RELEVANT ⁹ <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 10%; padding: 5px;">Category ⁹</th> <th style="padding: 5px;">Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²</th> <th style="width: 10%; padding: 5px;">Relevant to Claim No. ¹³</th> </tr> <tr> <td style="text-align: center; padding: 5px;">X</td> <td style="padding: 5px;">US, A, 1 481 504 (FK CHISHOLM) 22 January 1924</td> <td style="text-align: center; padding: 5px;">1-12</td> </tr> <tr> <td style="text-align: center; padding: 5px;">X</td> <td style="padding: 5px;">US, A, 2 763 510 (J DI NICOLA) 18 September 1956</td> <td style="text-align: center; padding: 5px;">1-12</td> </tr> <tr> <td style="text-align: center; padding: 5px;">X</td> <td style="padding: 5px;">CH, A, 497 205 (M DÄTWYLER & CO) 15 October 1970</td> <td style="text-align: center; padding: 5px;">1-12</td> </tr> <tr> <td style="text-align: center; padding: 5px;">A</td> <td style="padding: 5px;">US, A, 2 954 933 (M C CLARE) 4 October 1960</td> <td style="text-align: center; padding: 5px;">1-12</td> </tr> <tr> <td style="text-align: center; padding: 5px;">A</td> <td style="padding: 5px;">US, A, 2 986 337 (M C CLARE) 30 May 1961</td> <td style="text-align: center; padding: 5px;">1-12</td> </tr> <tr> <td style="text-align: center; padding: 5px;">A</td> <td style="padding: 5px;">DK, C, 59 204 (P O JOHANSEN) 17 November 1941</td> <td style="text-align: center; padding: 5px;">1-12</td> </tr> <tr> <td style="text-align: center; padding: 5px;">A</td> <td style="padding: 5px;">JP, A, 58-156368 (MATSUSHITA DENKO KK) 17 September 1983</td> <td style="text-align: center; padding: 5px;">1-12</td> </tr> <tr> <td colspan="2" style="text-align: center; padding: 5px;">.../...</td> <td></td> </tr> </table>			Category ⁹	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³	X	US, A, 1 481 504 (FK CHISHOLM) 22 January 1924	1-12	X	US, A, 2 763 510 (J DI NICOLA) 18 September 1956	1-12	X	CH, A, 497 205 (M DÄTWYLER & CO) 15 October 1970	1-12	A	US, A, 2 954 933 (M C CLARE) 4 October 1960	1-12	A	US, A, 2 986 337 (M C CLARE) 30 May 1961	1-12	A	DK, C, 59 204 (P O JOHANSEN) 17 November 1941	1-12	A	JP, A, 58-156368 (MATSUSHITA DENKO KK) 17 September 1983	1-12	.../...		
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<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>¹⁰ Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 45%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&" document member of the same patent family</p> </div> </div>																													
IV. CERTIFICATION <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; padding: 5px;"> Date of the Actual Completion of the International Search <div style="text-align: center; padding: 5px;">1985-11-14</div> </td> <td style="width: 50%; padding: 5px;"> Date of Mailing of this International Search Report <div style="text-align: center; padding: 5px;">1985-11-25</div> </td> </tr> <tr> <td style="padding: 5px;"> International Searching Authority <div style="text-align: center; padding: 5px;">Swedish Patent Office</div> </td> <td style="padding: 5px;"> Signature of Authorized Officer <div style="text-align: center; padding: 5px;"> Niklas Forslund </div> </td> </tr> </table>			Date of the Actual Completion of the International Search <div style="text-align: center; padding: 5px;">1985-11-14</div>	Date of Mailing of this International Search Report <div style="text-align: center; padding: 5px;">1985-11-25</div>	International Searching Authority <div style="text-align: center; padding: 5px;">Swedish Patent Office</div>	Signature of Authorized Officer <div style="text-align: center; padding: 5px;"> Niklas Forslund </div>																							
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FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

II

Fields Searched (cont)

US C1 239:150, 156, 222, 681, 682;
 118:323;
 404:93, 94

V. ☐ OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE 1

This international search report has not been established in respect of certain claims under Article 17(2) (a) for the following reasons:

1. ☐ Claim numbers....., because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claim numbers....., because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claim numbers....., because they are dependent claims and are not drafted in accordance with the second and third sentences of PCT Rule 6.4(a).

VI. ☐ OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING ²

This International Searching Authority found multiple inventions in this International application as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application.
2. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:
3. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers:
4. ☐ As all searchable claims could be searched without effort justifying an additional fee, the International Searching Authority did not invite payment of any additional fee.

Remark on Protest

- ☐ The additional search fees were accompanied by applicant's protest.
☐ No protest accompanied the payment of additional search fees.

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
A	GB, A, 19 080 (I GAENSLER) 21 September 1905	1-12
A	GB, A, 869 382 (M C CLARE) 19 January 1959	1-12